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DOI: <https://doi.org/10.4414/smw.2012.13667>

Posted at the Zurich Open Repository and Archive, University of Zurich

ZORA URL: <https://doi.org/10.5167/uzh-70777>

Journal Article

Published Version

Originally published at:

Monteverde, Settimio; Rid, Annette (2012). Controversies in the determination of death: perspectives from Switzerland. *Swiss Medical Weekly*, 142:w13667.

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Controversies in the determination of death: perspectives from Switzerland

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Summary

In 1968, an Ad Hoc committee at the Harvard Medical School advanced new criteria for determining death. It proposed that patients in irreversible coma with no discernible central nervous system activity were actually dead. The committee paved the way for the “whole brain” definition of death, which has reached broad public acceptance and legal enactment in many countries. Despite this, the philosophical and ethical debate about the “whole brain” definition of death is far from being closed. This paper analyses the ongoing controversy and evaluates the recent revision of the Swiss Academy of Medical Sciences guidelines for determining death.

Key words: *medical ethics; determination of death; end-of-life; organ transplantation*

Introduction

Death has been a constant companion of medical practice. Yet the need to define it has become a distinctive trait only of contemporary medicine. In the past, there was little controversy that a patient was dead when his or her heart and lungs had irreversibly ceased to function. Respiratory and circulatory arrest were closely linked to a loss of function of other vital organs, and clinicians had only limited means to maintain the function of some vital organs when others had failed. In particular, respiratory and circulatory arrest quickly resulted in irreversible brain damage, whereas severe brain damage quickly led to respiratory and circulatory arrest. This changed dramatically in the late 1950s when the use of mechanical ventilation and intensive care became widespread. Clinicians were now able to sustain cardiopulmonary function in patients with severe brain damage, who would die from cardiac arrest as soon as ventilatory support was withdrawn. Death was no longer a seemingly singular event after cardiopulmonary arrest, but

appeared to be dissociated into the failure of single vital organ systems.

Soon the question arose whether ventilated patients with seemingly no brain activity should be considered as being in the process of dying or being dead [1, 2]. Do clinicians have an obligation to treat these patients? Or are they permitted to withhold or withdraw life support? These questions became increasingly urgent as the number of ventilated patients soared, yet the critical care infrastructure remained both limited and costly. Surely the duty to treat did not apply to dead patients. The need to distinguish between dead and dying patients gained further urgency in the 1960s as the field of organ transplantation evolved rapidly. Under which conditions are clinicians permitted to remove vital organs from a patient, such as the heart, while ensuring the viability of these organs for transplantation? Traditional medical ethics requires clinicians not to kill their patients, but the removal of viable vital organs appeared to violate this obligation.

In 1968, an Ad Hoc Committee at the Harvard Medical School sought to settle these questions by defining irreversible coma – determined as “no discernible central nervous system activity” – as a new criterion for death [3]. The Harvard committee paved the way for the “whole brain” definition of death, which has become the legal definition of death in Switzerland and in many other countries. Yet despite the broad consensus among policy makers, defining death based on neurological criteria remains controversial. Is “whole brain” death the death of a human being or just the death of the human brain? Is the brain actually dead when the irreversible loss of brain function has been diagnosed following standard criteria? And to what extent are “whole brain” death criteria motivated by the practical need to retrieve viable vital organs for transplantation?

The present paper analyses the key lines of argument about definitions of death in the context of transplantation medicine. The arguments are traced in the debate about “whole brain” death in Switzerland, focusing in particular on the 2011 revision of the Swiss Academy of Medical Sciences (SAMS) guidelines for determining death [4]. Switzerland has an interesting history of allowing donation after cardiac arrest based on criteria of “whole brain” death. However, the recent guidelines raise concerns both about the irreversibility of “whole brain” death after 10 minutes of cardi-

Abbreviations

CPR	Cardiopulmonary resuscitation
DCD	Donation after cardiac death
PVS	Persistent vegetative state
SAMS	Swiss Academy of Medical Sciences

ac arrest and the certainty of a one-time clinical diagnosis in this situation. In many ways the Swiss debate can be seen as a burning glass for the problems that beleaguer the “whole brain” standard of death. The paper closes by discussing the main policy options for the future.

Death and the duties of doctors

Although a biological event, the death of a human being has profound moral implications [5, 6]. Death fundamentally changes what we owe to each other in moral terms. Obligations towards the living cease to exist, while new obligations towards the dead emerge. For example, the promise to be faithful to one’s husband no longer remains after his death. A widow also accrues the right to use, sell or even destroy her husband’s property after he has died – a right that she would not have had during his lifetime without his consent. At the same time, a widow acquires new obligations towards her deceased husband, such as the obligation to respect his wishes regarding burial.

Death is of particular moral importance in the clinical encounter. Clinicians use powerful interventions to save the life and improve or restore the health of their patients. However, if used inappropriately, these interventions can do patients more harm than good and sometimes even kill them. Clinicians therefore have fundamental moral obligations in relation to death. According to traditional medical ethics, clinicians’ primary duty is not to intentionally kill their patients. As a rule, clinicians ought to avoid preventable death by treating patients in need. They should, however, allow their patients’ death when they can no longer achieve the goals of treatment – in light of the preferences and values of the patient – and pain or other distressing symptoms prevail. Clinicians are also charged with declaring death consistent with the existing legal provisions. Traditionally clinicians determine death based on the cardiopulmonary standard, which defines death as the irreversible cessation of cardiopulmonary function.

The rise of transplantation medicine posed a challenge to these fundamental moral obligations of clinicians. Transplantation requires a source of viable organs, and human beings are the main source as the use of organs from animals or artificial organs is still limited. But the reliance on human donors poses a fundamental problem for the retrieval of viable vital organs, in particular the heart. If traditional medical ethics requires clinicians not to kill their patients, how can they harvest vital organs that are viable enough to be transplanted? Foregoing organ retrieval, and hence foregoing the transplantation of vital organs, does not seem to be a reasonable option. After all, clinicians also have a duty to avoid preventable death in patients with organ failure. A convenient way of solving this dilemma is to restrict organ retrieval to those patients who are dead, but nonetheless have viable organs. Patients who have no discernible central nervous activity, but whose cardiopulmonary function is maintained through mechanical ventilation and intensive care, seem to fulfill these criteria. These patients are determined to be dead in accordance with neurological criteria: they are dead on the “whole brain” standard of death.

The concept of “whole brain” death allows clinicians to reconcile the retrieval of viable vital organs with their traditional moral obligations regarding death, notably the duty not to kill their patients [7]. That is, a clinician does not kill a “brain dead” patient by removing his or her heart and/or other vital organs for the purposes of transplantation because the patient is already dead. Indeed, most laws and regulations allow vital organs to be harvested for transplantation only after the donor has been declared dead on established legal standards. This is often referred to as the “dead donor rule”. Yet making death a necessary condition for the retrieval of vital organs presses the question of when a patient is in fact dead.

(Re-)defining death

The pressure to retrieve organs for transplantation, along with the developing ability to sustain cardiopulmonary function in patients with severe brain damage, led to a fundamental re-thinking of death in modern medicine. The traditional “cardiopulmonary” standard still served its purpose of determining death outside the context of transplantation medicine (and continues to do so to this day). Yet it greatly limited the retrieval of viable vital organs for transplantation and seemingly demanded the continued treatment of patients with no discernible brain activity. This situation led to two approaches of reconceptualising death: “whole brain” and “higher brain” death. The “whole brain” standard of death is now implemented in many national legislations, including in Switzerland [8, 9]. However, due to the continuing shortage of transplantable organs, a new interpretation of the traditional “cardiopulmonary” standard of death has been introduced and widely implemented over the past two decades. The following sections analyses each of these standards of death and the key problems that they raise (see table 1 for an overview).

“Whole brain” death

The “whole brain” standard of death defines death as the irreversible loss of function of the higher brain and the brainstem. Above all this includes the irreversible loss of consciousness and the patient’s permanent inability to breathe spontaneously. According to the standard’s most influential justification, the brain is the central integrator of the human body, necessary for coordinating the various bodily systems and allowing the body to function as an “integrated whole”. Death is assumed to occur when the body stops functioning as an integrated whole. Death therefore occurs when the whole brain – that is, the higher brain and the brainstem – has ceased to function as the central integrator [2]. Given the functions inherent in these anatomical areas, the “whole brain” standard of death claims to represent an organismic view of the human being. It connects three basic dimensions of human life – the biological, the cognitive and the sentient [5].

The “whole brain” standard of death might seem plausible at first glance, because it reflects these basic dimensions of human life. Yet the growing clinical experience with “brain dead” patients reveals that these patients are still alive based on this standard. Robust evidence shows that the integrative functioning of the organism as a whole does

not depend exclusively on the brain. With the aid of mechanical ventilation and nursing care, patients who are correctly diagnosed as “brain dead” digest food, regulate salt and water homeostasis, maintain their temperature, grow hair, heal wounds, fight infections, react to stress, grow in length, go through puberty, and even gestate fetuses [10–12]. For sure, it is questionable that these functions – often termed as “residual” – really constitute human life. Yet “brain dead” patients clearly perform a variety of integrating functions of the organism as a whole, sometimes for years. Thus, it is not only counterintuitive that patients should be considered dead when they perform all these functions [13, 14]. “Brain dead” patients also fail the central requirement set out by the “whole brain” standard of death, namely that the body ceases to function as an integrated whole. The brain, it turns out, simply is not the central integrator of bodily functioning [11]. Importantly, other versions for the “whole brain” standard of death run into similar problems. For example, the U.S.

President’s Council recently argued that death occurs when a patient no longer carries out the “fundamental vital work of a living organism”, which includes being receptive to stimuli and signals from the surrounding environment [12]. However, many of the above listed functions in “brain dead” patients reflect receptivity to such stimuli, such as the ability to heal wounds and fight infections.

“Higher brain” death

The “higher brain” standard of death defines death as the irreversible loss of function of the higher brain, which involves the permanent incapacity to return to consciousness (as opposed to a temporary incapacity to return to consciousness, for example during sleep). No jurisdiction has adopted the “higher brain” standard, but several scholars have defended it as the best way of reconceptualising death in modern medicine [15]. While these scholars have developed different versions of the “higher brain” standard of death, a common element in all of them is the irrevers-

Table 1: Standards of death in the context of transplantation medicine.

Standard	Definition	Justification	Clinical tests in adults (Switzerland)*	Key objections
“Cardiopulmonary” death	Irreversible cessation of cardiopulmonary function.	<ul style="list-style-type: none"> Death of the organism: human life is essentially biological. Cardiopulmonary function is necessary for a living organism. 	<i>Does not apply in Switzerland, but in other countries (e.g., United States)^d.</i>	<ul style="list-style-type: none"> Traditional interpretation: limits the retrieval of viable vital organs (e.g., heart). Updated interpretation (“donation after cardiac death” protocols): the cessation of cardiopulmonary function is not irreversible after 5–10 min, but vital organs need to be removed during this time period in order to be viable.
“Whole brain” death	Irreversible cessation of functioning of the entire brain, including the brainstem.	<ul style="list-style-type: none"> Death of the organism as an integrated unit: human life is essentially biological, sentient, and cognitive. The brain (including brainstem) is the central integrator of overall bodily functioning: when the entire brain irreversibly ceases to function, the human organism no longer functions as an integrated whole. 	<p>1. Death due to primary brain damage</p> <ul style="list-style-type: none"> Clinical examination, conducted jointly by two physicians (one clinician not directly involved in caring for the patient)[#]. Appropriate additional test to demonstrate the absence of cerebral circulation only if <ol style="list-style-type: none"> the cessation of brain function is not adequately explained by the structural damage detected by imaging [or] potentially reversible factors cannot be excluded as contributory elements [or] cranial nerve function cannot be clinically assessed. <p>2. Death after permanent cardiac arrest</p> <ul style="list-style-type: none"> Diagnosis of cardiac arrest via transthoracic echocardiography; 10 min waiting time without cardiopulmonary resuscitation; Clinical examination (see above). 	<ul style="list-style-type: none"> The organism of patients who are correctly diagnosed as “whole brain dead” continues to function as an integrated whole: patients digest food, regulate salt and water homeostasis, maintain their temperature, grow hair, heal wounds, fight infections, react to stress, grow in length, go through puberty, and even gestate fetuses. It is not clear that the cessation of functioning of the entire brain is irreversible after 10 min of circulatory arrest.
“Higher brain” death	Irreversible cessation of functioning of the higher brain (no capacity for consciousness).	<ul style="list-style-type: none"> Death of the person: human life is essentially sentient and cognitive. Higher brain function is necessary for the capacity for consciousness, which is necessary for certain conceptions of personhood: when the higher brain irreversibly ceases to function, the individual person ceases to exist. 	<i>Does not apply in Switzerland nor in other countries.</i>	<ul style="list-style-type: none"> The standard has highly counterintuitive consequences: if self-awareness is seen as necessary for personhood, patients in irreversible coma or a persistent vegetative state would have to be considered dead; if the ability to reason or act morally is seen as necessary, severely demented patients would have to be considered dead.

* Tests for diagnosing “whole brain” death are based on the 2011 Guidelines for Determining Death issued by the Swiss Academy of Medical Sciences [4]. There is an additional chapter on determining death in children, which is not reflected in this table. According to the 2007 Swiss law on transplantation, death occurs after the irreversible loss of brain function (including the brain stem) [28].

[#] The clinical examination must demonstrate all of the following clinical signs: (1.) coma; (2.) bilaterally dilated pupils, unresponsive to light; (3.) absent oculocephalic and vestibulo-ocular reflexes; (4.) absent corneal reflexes; (5.) no cerebral response to painful stimuli; (6.) absent cough and gag reflexes; (7.) no spontaneous respiration (apnea test).

^d The “cardiopulmonary” standard is used to diagnose death outside the context of transplantation medicine.

ible loss of some ability for which the capacity for consciousness is necessary – for example, having self-awareness over time or being able to reason and act morally [5]. Proponents of the “higher brain” standard of death commonly argue that the essence of human life lies in being a person with some basic awareness or understanding of the self. On this view, death occurs when personhood is permanently lost.

It is not surprising that the “higher brain” standard of death has not been adopted by any legislature. There is no philosophical consensus on what constitutes personhood. Moreover, depending on what notion of personhood is assumed, the “higher brain” standard has highly counterintuitive consequences that would likely undermine public trust and support of organ donation. If self-awareness is seen as necessary for personhood, patients in irreversible coma or a persistent vegetative state would have to be considered dead despite their spontaneous cardiopulmonary activity. If the ability to reason or act morally is seen as necessary, severely demented patients would have to be considered dead – although they are capable not only of spontaneous breathing, but also of some forms of social life. The “higher brain” standard of death therefore has been discussed primarily among academics. Furthermore, even academics have raised concerns about this standard for its tendency to reduce human life to personhood and devalue the dimension of embodiment [14].

The resurgence of “cardiopulmonary” death

According to the traditional “cardiopulmonary” standard, death occurs after the irreversible cessation of circulatory and respiratory function. Widely adopted to diagnose death outside the context of transplantation medicine, the “cardiopulmonary” standard significantly limits the retrieval of viable vital organs for transplantation, in particular the heart. This situation changed in the early 1990s, however, when transplant centres began implementing protocols for an expedited “donation after cardiac death” (DCD) [16]. DCD protocols allow clinicians to harvest viable vital organs as soon as cardiopulmonary arrest is deemed to be irreversible, typically several minutes after diagnosing a loss of circulatory and respiratory function.

DCD protocols might be seen as a welcome return to the traditional “cardiopulmonary” standard of death. However, the available evidence about cardiopulmonary resuscitation suggests that some patients who undergo DCD are still alive based on this standard. In an effort to harvest vital organs that are viable for transplantation, some protocols allow organ retrieval as early as 75 seconds after diagnosing cardiac arrest [17]. Yet common clinical experience and clinical trials on cardiopulmonary resuscitation (CPR) show that some patients are successfully resuscitated after 5 or more minutes of asystole [18–21]. This suggests that cardiopulmonary function has not ceased irreversibly when vital organs are extracted after a waiting time of 5 minutes or less after cardiac arrest. The only way to make sense of such short waiting times is to assume that cardiac arrest is irreversible, provided that no efforts of resuscitation are made. Indeed, scant evidence supports this interpretation of irreversibility as there are no documented cases of cardiac autoresuscitation after 75 seconds of asystole when

CPR is not attempted [22]. But as some commentators have pointed out, this interpretation of irreversibility is not logical. Irreversibility normally means that something is impossible to undo – not that something would be possible to undo but for the fact that one chooses not to undo it [23]. That is, the determination of irreversible cardiac arrest does not depend on the clinical decision to forgo CPR, but it reflects a physiological condition of irreversibility [24]. To exclude the possibility of successful resuscitation and hence to ensure that cardiac arrest is irreversible, clinicians would have to wait more than 5 minutes after cardiac arrest before removing organs. Yet this approach would jeopardise the viability of organs in patients eligible for DCD.

The situation in Switzerland

Swiss guidelines for determining death: a brief history

The Swiss debate about standards of death began in 1969, when the first successful heart transplant in Switzerland raised public concern that the donor could not have been dead if his heart continued to function in the recipient [25–26]. Under considerable public pressure, the SAMS issued its first “Guidelines for the Definition and Diagnosis of Death” later that year [27]. These guidelines endorsed a dual standard of death as “(1.) irreversible cardiac arrest and – as a result of the latter – interrupted blood circulation of the organism, and thereby also of the brain: cardio-circulatory death, or (2.) total, irreversible cessation of cerebral function or death of the brain: cerebral death” [translation by authors].

The SAMS guidelines were unique insofar as they closely linked the “cardiopulmonary” standard of death in the context of organ transplantation to the irreversible loss of brain function. Subsequent revisions of the guidelines maintained and further developed this approach. For example, the guidelines' most recent version states that death can either occur through the “irreversible cessation of the functions of the brain, including the brainstem, as a result of primary brain damage or disorder; [or through] permanent cardiac arrest, which reduces or abolishes the cerebral circulation, until the irreversible cessation of the functions of the brain and brainstem - and thus death - ensues (death after cardiac arrest)” [4]. The 2007 Swiss Law on Transplantation equally defines death as the irreversible cessation of brain and brainstem function and, unlike comparable legislations, does not include a disjunctive “cardiopulmonary” definition of death [28]. This shows that “whole brain” death is the fundamental concept of death in Swiss guidelines and regulations in the context of transplantation medicine.

Consistent with this finding, DCD practices in Switzerland have been – and continue to be – justified on the “whole brain” standard of death. DCD protocols were first introduced in the U.S. in the early 1990s and adopted shortly thereafter in Switzerland [29]. Reflecting this change of practice, the 1996 version of the SAMS guidelines was the first to make the determination of “cardiac” death a separate topic from brain death [30]. DCD was allowed after 30 minutes of unsuccessful CPR in a hospital setting,

provided that two qualified clinicians had clinically diagnosed “whole brain” death (i.e. deep coma, no cranial nerve reflexes, etc.). In line with contemporary guidance from the American Academy of Neurology [31], the 1996 guidelines also introduced the requirement of a second clinical examination in ventilated “brain dead” patients after a minimal observation period of 6 hours (or longer in children). No explanation was given as to why a second clinical examination was deemed necessary to confirm “whole brain” death in ventilated patients, but not in patients in cardiac arrest after CPR had failed.

The 2005 version of the guidelines continued to endorse differential requirements for clinically diagnosing brain death in ventilated patients and patients in cardiac arrest [32]. It also broadened the scope of patients eligible for DCD, stipulating that vital organs can be removed from patients after 10 minutes of observed and uninterrupted cardiac and circulatory arrest, either following no CPR or unsuccessful CPR for 20 minutes. The most recent revision of the SAMS guidelines from 2011 essentially maintains these requirements regarding DCD, although cardiac arrest must now be documented by a transthoracic echocardiogram [4]. Importantly, the guidelines no longer require that ventilated “brain dead” patients be clinically examined for a second time after a minimum waiting period of 6 hours. Consistent with current opinion and recommendations from the American Academy of Neurology [33–34], the clinical examination has to be performed only once – albeit by two qualified physicians – provided that the loss of brain function is adequately explained.

The “whole brain” death approach to donation after cardiac death

The “whole brain” death approach to DCD seemingly avoids the problem of irreversibility that arises when DCD is based on the “cardiopulmonary” standard of death. Because the irreversible cessation of cardiopulmonary function is not a requirement, it is irrelevant whether or not the loss of cardiac function is reversible. Yet the analogous question arises regarding the irreversible loss of brain function, including the brainstem, after 10 minutes of cardiac arrest. Not only are some patients successfully resuscitated after 5 or more minutes of asystole, but some of them also recover with normal or almost normal neurological function. Resuscitation research shows that 10–15% of patients recover with normal or only moderately disabled cerebral function when they are successfully resuscitated after more than 5–6 minutes (and up to 35 minutes) of cardiac arrest [19–21]. This suggests that the loss of brain function is not irreversible after 10 minutes of cardiac arrest. Data from animal research further support this claim, as good neurological outcomes after delayed CPR have been documented in dogs, cats and monkeys [35, 36].

Furthermore, in the context of DCD, it is not possible to confirm the clinical diagnosis of “whole brain” death without compromising the viability of vital organs for transplantation. For sure, the SAMS guidelines mandate that two physicians diagnose “whole brain” death [4]. But a one-time clinical exam may not be sufficient to establish the irreversible loss of brain and brainstem function with reasonable certainty. In its 2010 guideline update on de-

termining “whole brain” death in ventilated patients, the American Academy of Neurology states that “there is insufficient evidence to determine the minimally acceptable observation period to ensure that neurologic functions have ceased irreversibly” [33]. The Academy goes on to offer “opinion-based” guidance, stating that one neurologic examination is adequate for pronouncing brain death. However, this recommendation is explicitly based on the assumption that “a certain period of time has passed since the onset of the brain insult to exclude the possibility of recovery (in practice, usually several hours)” [33]. Obviously this is not the case in the context of DCD. For the same reason, data on the benefits of repeat examination in ventilated “brain dead” patients may be difficult to extrapolate to patients in cardiac arrest [37]. Hence both the irreversibility of “whole brain” death after 10 minutes of cardiac and circulatory arrest and the certainty of a one-time clinical diagnosis in this situation are questionable. Furthermore, even if “whole brain” death was irreversible and properly diagnosed by a one-time clinical exam, the concerns about “whole brain” death described above would still pertain.

Policy implications

Each of the existing standards of death gives reason for serious concern. At the same time, organ transplantation saves and improves the lives of many patients and would be much too costly, in moral terms, to give up. Alternative sources of organs from animals or the laboratory bench will at best be available in the distant future. How, then, should we proceed in this situation? The following paragraphs briefly discuss the key policy options that societies may embrace today.

Abandoning the “dead donor rule”

One proposal is to abandon the requirement that patients must be dead to retrieve their vital organs in a viable condition. Instead, the ethical acceptability of harvesting viable vital organs would depend on two conditions: the valid consent of the donor and an acceptable risk-benefit ratio for both the individual patient and society [7, 38]. That is, organs could only be removed if the patient or his or her surrogate has consented to the removal and the patient’s clinical prognosis is bleak. This approach effectively separates questions surrounding the determination of death from questions about the ethical permissibility of retrieving viable vital organs for transplantation. Death would no longer be a requirement for organ removal.

The approach has several benefits. Organ transplantation could continue despite the finding that vital organ donors are not dead on the existing standards of death. This would promote honest relationships between patients, clinicians, and the public. The approach also adheres to the fundamental ethical requirements for clinical care, namely consent and a favourable risk-benefit ratio. It is therefore consistent with how treatment decisions are made in medicine more generally, including in areas of medicine that are closely related to “post-mortem” organ donation (e.g., live kidney and liver donation, end-of-life care). However, abandoning the “dead donor rule” in favour of consent and risk-benefit considerations would clearly expose organ ex-

traction as an act of permissible killing. This seems to be at odds with clinicians' traditional duty not to intentionally kill their patients. While exceptions from this duty are arguably justifiable, abandoning the "dead donor rule" would likely expose further inconsistencies of current clinical practice with the traditional norms of medicine and/or provoke additional revisions of these norms (e.g., regarding end-of-life care) [7]. It is not clear that clinicians and the public would be friendly to these changes. Abandoning the "dead donor rule" might thus reduce trust in clinicians as well as the willingness to donate organs to the public.

Individualising standards of death

Another proposal is to allow individuals to choose their own standard of death from a preset range of options [39]. This approach would concede that reasonable people might disagree about the existing standards of death. Consistent with the tenets of liberal democracies, it would restrict the power of the state to impose one standard of death on all citizens and promote individual choice. Although in line with the goals and values of Western societies, individualised standards of death would be fraught with practical problems. They would result in considerable moral and legal uncertainty, as individuals in the same clinical state would be either dead or alive depending on their preferred standard of death. Furthermore, it is not clear that individuals would want to choose "their" standard of death. Even with highly proactive advance care planning programmes, only a third of patients complete an advance directive for their end-of-life care [40]. It seems unlikely that individuals would be more willing to think about their death than their care at the end of life.

Maintaining the status quo

Given the problems of abandoning the "dead donor rule" or individualising standards of death, another option is to simply leave things as they are. For sure, the above discussion suggests that patients eligible for DCD and "brain dead" patients are neither dead based on the "whole brain" nor on the "cardiopulmonary" standard of death. Maintaining these standards would therefore require some dishonesty on behalf of clinicians and increasingly the public as well. It is also questionable that death, even if it could be clearly determined in patients whose vital organs are still viable for transplantation, is a necessary ethical requirement for procuring such organs [7]. However, in the public policy arena there is an inevitable bias towards the status quo [41]. Given the substantial uncertainties of fundamental reform, in particular regarding the impact on organ donation rates, it seems likely that the "dead donor rule" and the concept of "whole brain" death will be upheld in the foreseeable future. Although this approach has clear limitations as discussed in this paper, it may well be the best way to maintain public trust in clinicians, regulators and legislators [42].

Conclusion

Although death has been a constant companion of medical practice, the past decades have seen intense controversy over what constitutes death and how it should be deter-

mined. The traditional "cardiopulmonary" standard of death posed a serious problem in the context of transplantation medicine, as it significantly limited the removal of viable vital organs for transplantation. The introduction of the "whole brain" standard of death addressed this problem, but robust empirical evidence has now emerged that "brain dead" patients are not dead based on this standard. Furthermore, despite introducing the concept of "whole brain" death, organs for transplantation became increasingly scarce. While the development of DCD protocols helped to ameliorate this situation, questions arose as to whether DCD is consistent with either the traditional "cardiopulmonary" or the "whole brain" standard of death. Given the tremendous benefits of transplantation medicine, as well as the significant uncertainties associated with reforming transplantation policy, fundamental changes in the determination of death are unlikely. However, controversy surrounding the "whole brain" standard of death and DCD protocols will surely continue – in Switzerland and elsewhere.

Acknowledgement: The authors thank Franklin Miller and an anonymous reviewer for critical input on a previous draft of this paper.

Funding / potential competing interests: Settimio Monteverde was Vice Chair of the Swiss Academy of Medical Sciences (SAMS) working group that prepared the 2011 version of the SAMS Guidelines for the Determination of Death in the Context of Organ Transplantation. The views expressed in this paper are his own and must not be attributed to the SAMS. No other potential conflict of interest relevant to this article was reported.

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